Extended Range Forecast for Australian-Region Tropical Storm Activity in 2004/5

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Forecast Summary

TSR anticipates the 2004/5 Australian season will see activity either close to or slightly above average.

The TSR (Tropical Storm Risk) consortium presents a long-range forecast for Australian-region tropical storm and severe tropical cyclone numbers, and for Australian tropical storm strike numbers in 2004/5. The forecast spans the Australian season from the 1st November 2004 to the 30th April 2005 and is based on data available through the end of March 2004. Our main predictor is the forecast anomaly in October-November Niño 4 sea surface temperature (SST) which we anticipate will be slightly cooler than normal at -0.14 ± 0.40 ^{o}C. Since SSTs in this region are linked to vertical wind shear over the Australian region during Austral summer, an average Niño 4 SST indicates average wind shear and average tropical storm activity. Thus we expect Australian basin cyclone activity and landfalling numbers to be close to or slightly above average in 2004/5. Monthly updated forecasts will follow through to early December 2004.

Australian Region Total Numbers Forecast for 2004/5

		Severe Tropical Cyclones	Tropical Storms
TSR Forecast (±FE)	2004/5	5.5 (±1.5)	11.4 (±2.4)
29yr Climate Norm (±SD)	1975/6-2003/4	5.8 (±2.4)	10.7 (±3.7)
Forecast Skill at this Lead	1989/90-2003/4	32%	14%

Key:
Severe Tropical Cyclone	=	1 Minute Sustained Wind > 63Kts = Hurricane Category 1 to 5.
Tropical Storm	=	1 Minute Sustained Wind > 33Kts.
SD	=	Standard Deviation.
FE (Forecast Error)	=	Standard Deviation of Errors in Replicated Real Time Forecasts 1994/5-2003/4.
Forecast Skill	=	Percentage Improvement in Mean Square Error over Running 10-year Prior Climate Norm from Replicated Real Time Forecasts 1988/9-2002/3.
Australian Region	=	Southern hemisphere 100°E to 170°E (Storm Must Form as a Tropical Cyclone Within to Count).

- Very severe tropical cyclones (hurricane category 3-5) are not forecast due to data reliability problems in the historical record.

- Our Australian region (100°E to 170°E), while slightly non-standard, is selected to provide the best overview for tropical cyclone activity around the whole of Australia.

There is a 41% probability that Australian tropical storm numbers in 2004/5 will be above average (defined as more than 12 tropical storms), a 44% likelihood they will be near normal (defined as between 9 and 12 tropical storms) and a 15% chance they will be below normal (defined as less than 9 tropical storms). The 1975/6-2003/4 climatology probabilities for each category are 31% (above-normal), 34.5% (near-normal) and 34.5% (below-normal).

Australian Landfalling Numbers in 2004/5

		Tropical Storms
TSR Forecast (±FE)	2004 /5	5.0 (±1.9)
Average (±SD)	1975/6-2003/4	4.7 (±2.2)
Forecast Skill at this Lead	1989/90-2003/4	28%

Key: Landfalling Region = Northern Australian coast from Perth around to Brisbane.

- Severe tropical cyclone strikes are not forecast due to their low occurrence rate and to their lack of correlation with tropical storm strike numbers.

There is a 30% probability that Australian tropical storm strike numbers in 2004/5 will be above average (defined as more than 5 landfalling tropical storms), a 56% likelihood they will be near normal (defined as 4 or 5 landfalling tropical storms) and a 14% chance they will be below normal (defined as less than 4 landfalling tropical storms). The 1975/6-2003/4 climatology probabilities for each category are 28% (above-normal), 41% (near-normal) and 31% (below-normal).

Predictors and Key Influences for 2004/5

Our model exploits the predictability of tropical sea surface temperatures (SSTs). Anomalous patterns of SST are the primary source of tropical atmosphere forcing at seasonal and interannual timescales. The predictors in our model for tropical storm and severe tropical cyclone numbers are:

1. The forecast October-November SST for the El Niño Southern Oscillation (ENSO) Niño 4 region 5^oN-5^oS, 150^oW-160^oE. (Main predictor for leads up to November).

2. The observed October-November SST for the Niño 4 region. (Main predictor for December forecast).

The predictor in our model for Australian landfalling tropical storm numbers is the forecast December-March SST for the extended Niño region 5° N-5° S, 120^oW-177.5^oW.

The Niño 4 and extended Niño forecast SSTs come from an in-house multi-ensemble extension of the Knaff and Landsea (1997) ENSO-CLIPER model (Lloyd-Hughes et al, 2004).

The key factor behind our forecast for Australian-region tropical storm activity in 2004/5 being close to or slightly above average is the anticipated neutral effect of early austral summer SSTs in the Niño 4 region. Average SSTs in this region lead to average atmospheric vertical wind shear over the Australian region during Austral summer; a condition favouring average tropical storm activity. Our current forecast SST anomaly (1974/5-2003/4 climatology) for October-November 2004 Niño 4 SST is -0.14±0.40 ^{o}C. The forecast skill for this predictor is 57% (assessed using replicated real-time forecasts over the last 15 years). Our landfalling predictor (December 2004 - March 2005 forecast SST value for the extended ENSO region 5^oN-5^oS, 120^oW-177.5^oW) is anticipated to be -0.26±0.88 ^{o}C. The forecast skill for this predictor at this lead is 14%.

Forecasts and New Developments for 2004/5

For the 2004/5 Australian-region season, TSR will be: (1) Issuing monthly updated deterministic forecasts through to early December for Australian-region tropical storm and severe tropical cyclone numbers and for Australian tropical storm strike numbers; (2) Issuing forecasts in early November and early December for the basin and Australian landfalling ACE indices. The ACE index reflects a combination of intensity and duration for all storms each season and may be linked more closely to total losses and disruption than the individual number of tropical storms or severe tropical cyclones; (3) Issuing probabilistic forecasts for the numbers of basin and landfalling tropical storms; (4) Using a new multi-

ensemble statistical model for predicting the Niño 4 and extended Niño SSTs; (5) Providing real-time forecasts through the TSR Storm Tracker for active Australian-region storm systems. These forecasts are updated every 6-12 hours and provide the best available information on storm strength, track and track uncertainty all with various levels of zoom. Current and forecast 2-dimensional windfields are available for systems of at least severe tropical cyclone force.

Potential Benefits

Tropical storms are a costly natural disaster for northern Australia and adjacent southwest Pacific islands between latitudes 10°S and 30°S and longitudes 100°E and 170°E. The average storm damage bill per year 1990/1-2000/1 for this region is US $55 million (2001 $). By providing a lead time, storm forecasts help governments, administrators and businesses plan ahead, thereby reducing the risk and uncertainty from varying active and inactive storm seasons. TSR has an impressive forecast track record. Recent long-range forecast successes include those for the 2001/2, 2002/3 and 2003/4 Australian-region tropical cyclone seasons.

Further Information

Further information on the TSR forecast methodology and on TSR in general, may be obtained from the TSR website (http://tropicalstormrisk.com). The TSR next monthly forecast update for Australian-region tropical storm activity in 2004/5 will be issued on the 11th May 2004.